

Engineers of the Future: The University and 21st Century Challenges



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Engineers of the Future

- **Supply Challenges**
- **Demand Challenges**
- **Shifting High Demand Areas**
- **Industry Responses**
- **University Responses**
- **Government Responses**
- **New Strategies**



Supply Challenges

- **Production of Entry-Level Engineers**
 - **78,000 B.S. Degrees, 1985/86**
 - **62,500 B.S. Degrees, 1998/99**
 - **Slight Increase 1–3% through 2002**
- **Unemployment of Engineers in the Workforce**
 - **2,142,000 Engineers Employed**
 - **Unemployment Less than 1% Q2/2000**



Demand Challenges

- **MSU Study 1999/2000 to 2000/01**
Increases
 - **61% B.S.**
 - **106% M.S.**
- **ISU Career Fair**
 - **300 Company Increase Since 1995/96**
 - **Interviewing Companies Increased by 26% Fall 1999 to Fall 2000**



Demand Challenges Continued

- **Accelerating Factors**
 - **Accumulating Deficit**
 - **Retirements**
 - **Skills Replacement**



Shifting High Demand Areas

- **Bachelors Degrees**
 - **Electrical Engineering**
 - **Mechanical Engineering**
 - **Computer Engineering**
- **Masters Degrees**
 - **Electrical Engineering**
 - **Computer Engineering**
 - **Mechanical Engineering**



Shifting Areas of Demand Cont.

- **Doctoral Degrees**
 - **Electrical Engineering**
 - **Computer Engineering**
 - **Mechanical Engineering**
 - **Chemical Engineering**



Industry Responses

- **Expanding the Candidate Pool**
 - **Community College Technicians**
 - **Non-Engineering Degrees**
 - **Lower Ranking Schools**
- **On-the-Job Education**
 - **Distance Learning**
 - **Incentives for Employees**
 - **Retraining**
 - **New Skills Development**



Industry Responses Continued

- **Increased Compensation/New Entrants**
 - **Salary 10/20%**
 - **Tuition Reimbursement 10%**
 - **Relocation Costs 69%**
 - **Bonuses**
 - * **Signing 75%**
 - * **Training 74%**
 - * **Stock Options 20%**



Industry Responses Continued

- **Non-Pecuniary Incentives**
 - **Flexible Hours 53%**
 - **Work Environment 67%**
 - **Human Resources Services 90%**



University Responses

- **Recruiting**
 - **High Schools**
 - **Scholarships/Work Study**
 - **Career/Market Information**
 - **Job Fairs**
 - **Program Flexibility**



University Responses Continued

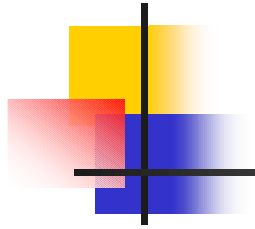
- **Retention**
 - **New Curricula**
 - **Emphasis Learning vs. Teaching**
 - **Internships**
 - **Coop Programs**
 - **Learning Communities**



University Responses Continued

- **Curriculum Change**
 - **Experiential Learning**
 - **Coops**
 - **Internships (early)**
 - **Changed Learning Environment**

- **Faculty/Cultural Change**
 - **Facilities Improvement**
 - **Welcoming Faculty**
 - **Faculty Training**



University Responses Continued

- **Competencies Alignment**
 - **Engineering Knowledge**
 - **Quality Orientation**
 - **Cultural Adaptability**
 - **Communication**
 - **Professional Impact**
 - **General Knowledge**
 - **Initiative**



University Responses Continued

- **Competencies Alignment Continued**
 - **Analysis and Judgment**
 - **Teamwork**
 - **Customer Focus**
 - **Continuous Learning**
 - **Innovation**
 - **Planning**
 - **Integrity**



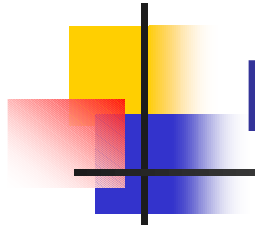
Government Responses

- **Information Assembly Dissemination**
- **Grant Support**
- **Quality K–12 Schools**
- **Diversity Incentives**
- **Mostly Passive Involvement**



New Strategies

- **Continuing as Now/High Cost**
 - **Global Competition**
 - **Regional Development**
 - **Increased Adoption Rates**
 - **Poor Use of Existing Labor Force**
 - **Stretching Qualifications Requirements**



New Strategies Continued

- **Increasing the Pool**
 - **Extending Productive Life**
 - **Working with Technical Schools**
 - **Radical Curriculum Change**
 - **Improving Learning Process**
 - **Working with K-12 Schools**



New Strategies Continued

- **Joint Efforts – Industry, Government, Universities/Education System**
- **Examples**
 - **Bachelors of Applied Science**
 - **Youth and the IOF**
 - **New Units K–12 Curriculum**
 - **Research on Teaching/Learning**
 - **Access to Education/Training**